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ABSTRACT

This material describes an activity using vinegar and baking soda to generate carbon dioxide, and writing a report using the Appleworks word processing program for grades 3 to 8 students. Time requirement, relevant process skills, vocabulary, mathematics skills, computer skills, and materials are listed. Activity procedures including class discussion are discussed. Four kinds of curriculum extension activities are described: (1) "Report Writing," using a word processing program; (2) "Volcanos" (simulating an eruption); (3) "Letter Writing"; and (4) "Handbook of Chemistry and Physics" (looking up the formula for baking soda or sodium hydrogen carbonate). (YP)

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ED307165

# CHEMISTRY FOR KIDS
# GENERATING CARBON DIOXIDE IN ELEMENTARY SCHOOL CHEMISTRY AND USING A COMPUTER TO WRITE ABOUT IT

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## INTRODUCTION

Carbon dioxide ($CO_2$) exists in our environment mostly as the product of chemical reactions like the combustion of hydrocarbon fuels. While we don't often think about it, $CO_2$ is used extensively in our everyday lives. We've all seen dry ice. Well, dry ice is simply frozen $CO_2$ or $CO_2$ in the solid state. While carbon dioxide is a gas at room temperature, if we cool it enough, it becomes solid. It also is used in soft drinks, such as 7-Up. When a bottle cap is removed from 7-Up, we see the $CO_2$ bubble to the surface. The effects of carbon dioxide are seen when baking soda is added to a cake batter and the cake rises as it bakes (it is in packaged cake mixes). $CO_2$ is also used in some fire extinguishers. When an acid, such as, vinegar is mixed with baking soda, $CO_2$ is produced.

Carbon dioxide is also extremely important to our existance. Plants use $CO_2$ in photosynthesis as they manufacture sugar. This process helps to maintain the environmental $CO_2$ and so limit the "greenhouse" effect.

## PRESENTATION

Students who participate in this activity generate carbon dioxide using vinegar and baking soda. They find that the $CO_2$, generated as a result of mixing the chemicals together, requires more room than is available in the container where the reaction takes place and so the container bubbles over. As a method of showing students that the gas builds up a pressure when it cannot expand, we have them cap the test tube (pill bottle and pill bottle cap) where the reaction takes place. The gas pressure created by the reaction then blows the top off the

test tube. Teachers who use the computerized report writing suggestion listed below in the "Curriculum Extension" section should know how to set up, print, and save AppleWorks word processing files.

Grade Level. Grades 3 - 8 (this activity is suitable for use in college level elementary science education methods courses).

Time Requirements. About 20 minutes for the main activity.

Science Skills.

1. Observing.
2. Predicting.
3. Mixing Chemicals.
4. Measuring.
5. Hypothesize.
6. Estimating.

Vocabulary

1. Carbon dioxide.
2. Dry ice.
3. Reaction.
4. Chemical.
5. Gas.
6. Solid.
7. Format.
8. Store.
9. Word processor.

Mathematics Skills

1. Metric Measuring.
2. Estimating.

Computer Skills

1. Disk formatting.
2. Word processor file construction.
3. File printing.
4. File storage.

Materials. You may wish to have students bring pill bottles from home, in which case, time must be included for planning.

1. 1 large pill bottle with snap on cap (test tube). If a bottle with a snap-on cap cannot be located, any straight sided small diameter bottle with a snapon cap will work. Caution, bottles with screw-on caps should not be used.
2. 1 teaspoon.
3. 1/2 of the pill bottle (test tube) full of vinegar.
4. 1/4 of 1 teaspoon of baking soda.
5. 1 piece of 8 1/2" x 11" paper for each student.
6. 1 cardboard tray or a flat piece of cardboard (30cm x 40cm).
7. 1 eye dropper and bottle.
8. 1 metric ruler for student.
9. 1 pencil for each student.

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INSERT FIGURE 1 ABOUT HERE

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10. Materials for the computer curriculum extension activity.
    a. 1 Apple IIe or GS computer with printer for each class.
    b. 1 copy of the AppleWorks program (versions 1.2, 1.3, 2.0 and 2.1 will work - V2.0 and 2.1 are generally used only with the GS computer).
    c. 1 blank data disk for each computer. Disk size depends upon disk drive size.

Procedures.

1. Materials Handout. Give each student the materials listed

above.

2. Paper Measuring and Cutting. Have each student measure and cut a square piece of paper (12 cm on a side).
3. Paper Folding. Fold the paper in half with a light crease (See Figure 1).
4. Measure Baking Soda. Place approximately 1/4 of a teaspoon of baking soda on the folded piece of paper.
5. Test Tube Filling. Fill the pill bottle (test tube approximately 1/2 full of vinegar using the eye dropper.
6. Tray and Materials. Place all materials to be used in this experiment on the cardboard tray.
7. Discovery Period. Allow a brief period during which students are encouraged to see what they can discover using the materials that have been provided.
8. Class Discussion. Conduct a class discussion during which students are told about the chemicals they have and asked to hypothesize regarding what will be the outcome of mixing the chemicals together. Hypotheses should be written on a chalk board or flipchart.
9. Additional Baking Soda and Vinegar. Where necessary, provide students with additional baking soda and vinegar.
10. Pouring Baking Soda. Pour the baking soda into the test tube (See Figure 2).

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INSERT FIGURE 2 ABOUT HERE

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11. Capping The Test Tube. Cap the test tube (pill bottle cap) and watch. As the chemical reaction proceeds, the gas pressure builds

up inside the container and causes the top to pop (See Figure 3).

12. Class Discussion. Conduct a class discussion during which students are asked to describe their observations. They should be asked why the top blew off the test tube.

Curriculum Extension.

1. Report Writing. Write a report about the activity using AppleWorks word processing as follows:
   a. Program Loading. Load the AppleWorks into the computer.
   b. Formatting. Format the blank data disk. This can be accomplished by selecting option #5, "Other Activities" from the "Main Menu" and then option #5 from the "Other Activities" menu.

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INSERT FIGURE 3 ABOUT HERE

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   c. File Construction. Open a new word processing file and write the report. Student's last names could be used as computer file names (see Figure 4).
   d. File Saving. Save the file by pressing the OPEN-APPLE and the "S" keys at the same time.
   e. File Printing. Print the file by pressing the OPEN-APPLE and the "P" keys at the same time and following the directions on the screen.
2. Volcanos. Have students build a paper mache volcano around their large pill bottle (test tube) and then mix vinegar and baking soda in the test tube to simulate an eruption. If you want them to paint the volcano, you'll need tempra paints and brushes.

If you want to colo the vinegar, you'll need food coloring.

3. Letter Writing. Write a letter to a friend describing the activity. Use the word processor when writing the letter.
4. Handbook of Chemistry and Physics. Have older students look up the formula for baking soda or sodium hydrogen carbonate ( its chemical formula is $NaHCO_3$)

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INSERT FIGURE 4 ABOUT HERE

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## SUMMARY

For most people, chemistry seems mysterious and confusing, yet those who begin to study the subject at an early age find it not so mysterious and very exciting. Why not have your students discover this excitement by conducting this experiment? Your students will have a chance to observe the results of a chemical reaction which they have caused by mixing two of the correct chemicals together. In addition, they will come away from the activity with a better understanding of gases. If your children do not have the pill bottle or some sort of student chemistry set, you can still conduct the experiment using a pop bottle, cork, vinegar and baking soda.

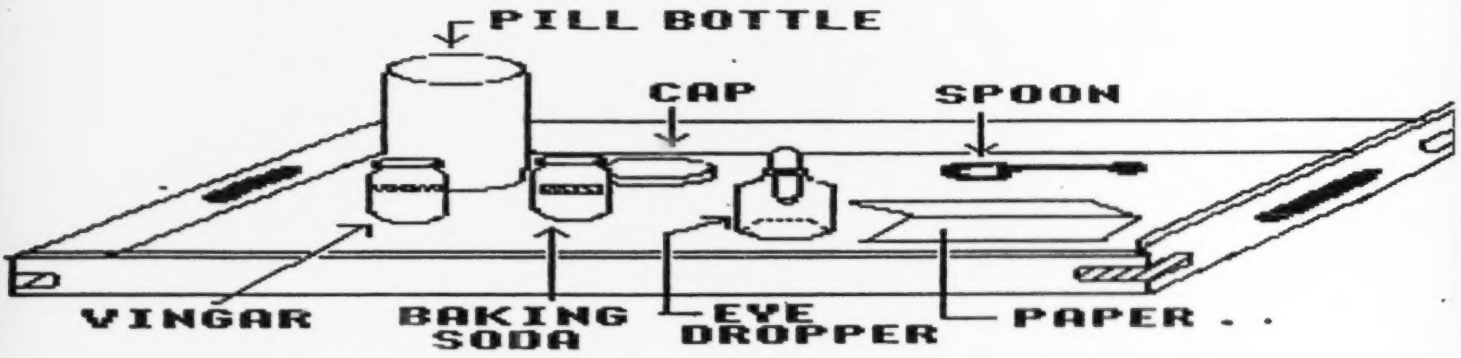


Figure 1. Equipment Tray And Supplies Needed For The Experiment.

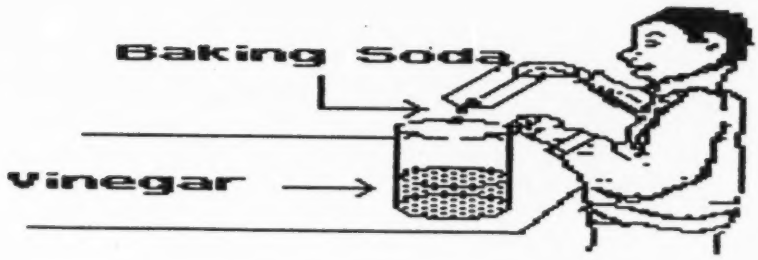


Figure 2. Placing The Baking Soda In The Test Tube.

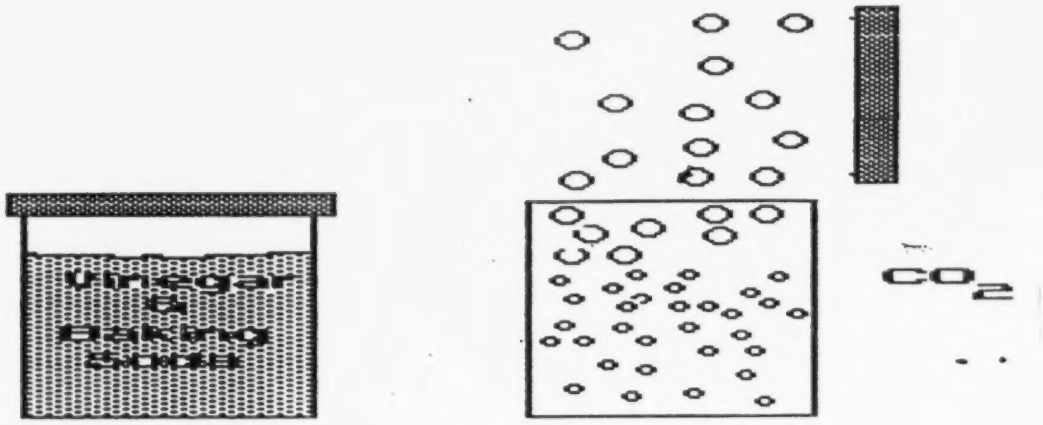


Figure 3. Gas Pressure Blowing The Top Off The Test Tube.

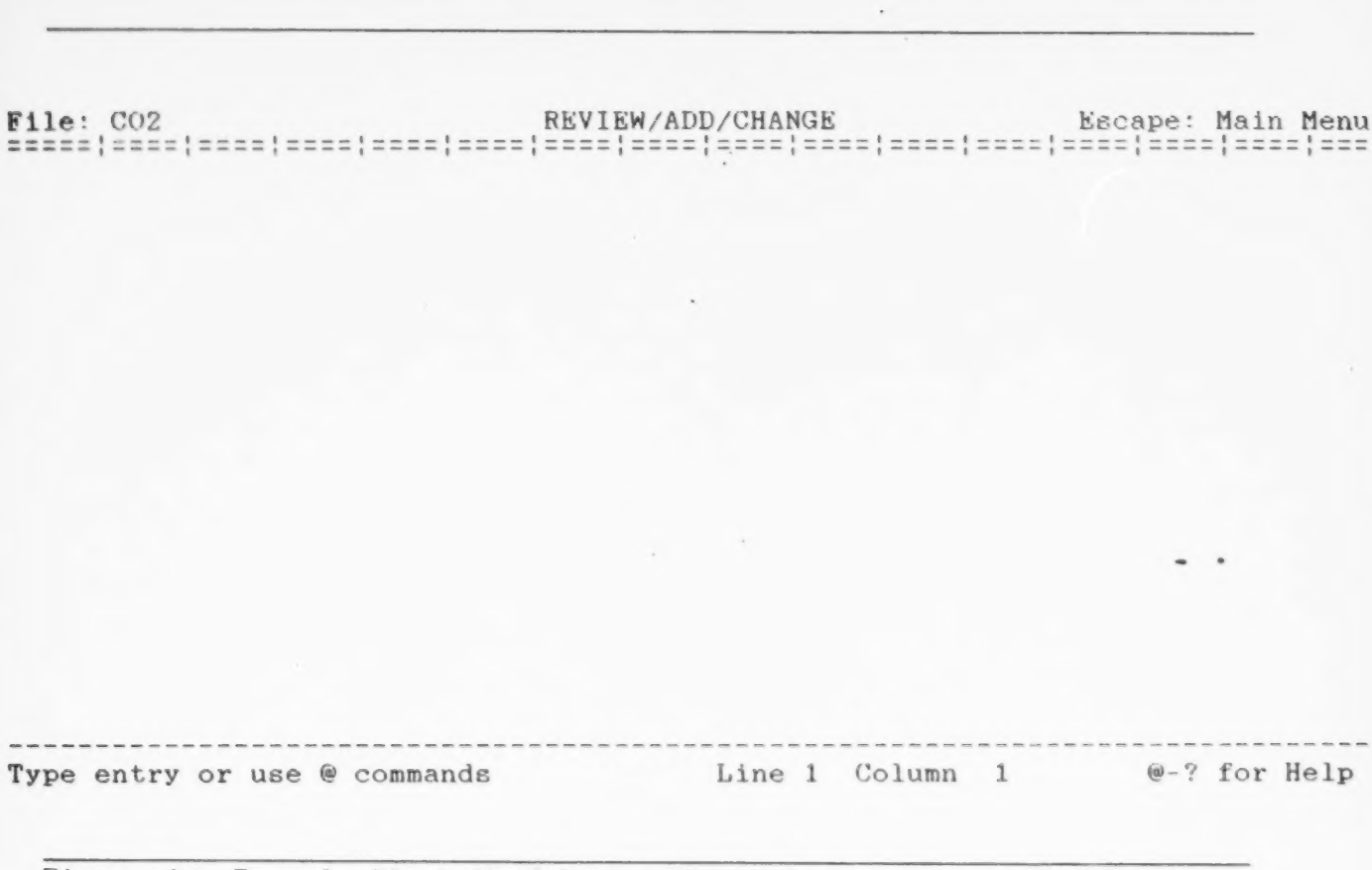


Figure 4. Example Blank Word Processing File.